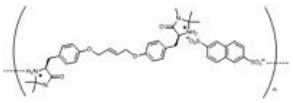
TOYOHASHI UNIVERSITY OF TECHNOLOGY
Master Technology, Create Technology

No. 9, November 2012

Research highlights

Novel main-chain polymer of chiral organocatalyst: Effective polymeric chiral organocatalyst for asymmetric reactions



Main-chain polymer of chiral imidazolidinone.

Naoki Haraguchi

Immobilization of a chiral organocatalyst onto polymers has considerable advantages over corresponding molecular catalysts with respect to isolation of the products and reuse of polymeric catalysts.

Many efforts have been made to synthesis side-chain-functionalized polymeric chiral catalysts in which chiral organocatalysts are immobilized by covalent bonding on the side chains of polymers. To-date functionalization of chiral organocatalysts has always been necessary for immobilization onto polymers, which sometimes leads decreased catalytic activity.

Recently, Naoki Haraguchi and colleagues at Toyohashi University of Technology have developed a novel method for synthesis of main-chain polymers of chiral organocatalysts. They designed and synthesized main-chain polymers of chiral imidazolidinone by successive intermolecular addition reactions of chiral imidazolidinone dimers and disulfonic acid. Chiral imidazolidinones were uniformly introduced by ionic bonding into the main-chain of polymer. Notably, this method did not necessitate functionalization of imidazolidinone.

The researchers used the main-chain polymers of chiral imidazolidinone as polymeric chiral organocatalysts in the asymmetric Diels-Alder reaction. Remarkably, some main-chain polymers of chiral imidazolidinone showed higher catalytic activity (up to 99% ee) than the corresponding molecular catalyst in the reaction. In addition, the polymeric chiral organocatalyst were recovered and reused at least three times without loss of the enantioselectivity.

The reasons for the observed increase in the enantioselectivity are not clear yet, however, this novel research opens up the possibility not only for the synthesis of non-covalent polymeric chiral organocatalysts but also for other advances in polymer chemistry.

Reference

Naoki Haraguchi, Hitomi Kiyono, Yu Takemura, and Shinichi Itsuno. “Design of main-chain polymers of chiral imidazolidinone for asymmetric organocatalysis application” *Chemical Communications* **2012**, *48*, 4011-4013.
Digital Object Identifier (DOI): 10.1039/c2cc18115k